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ABSTRACT

This paper presents a theoretical and empirical evaluation of the impact of teacher bargaining on the demand for school inputs, the compensation of school personnel, and the level of educational expenditure in public school districts. It is demonstrated that the major impact of bargaining for teachers has been on a regional, rather than on a district by district, level, and, contrary to the results of previous studies, bargaining does appear to have a substantial and significant effect on teachers' salaries. The empirical analysis is carried out on a sample of Public school districts located in the state of California. (Author)

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THE IMPACT OF COLLECTIVE BARGAINING FOR TEACHERS ON RESOURCE ALLOCATION IN PUBLIC SCHOOL DISTRICTS

by

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With the rapid growth of collective bargaining in public education, there have been a number of empirical studies attempting to determine the impact of teachers' negotiations on salaries.[1] These attempts usually involve the estimation of behavioral relationships to explain the variations in teachers' salaries as a function of various school districts and teacher characteristics. The effect of bargaining is generally represented by either a dichotomous dummy variable, which reflects whether or not negotiations occured in a district, or the fraction of teachers in the district belonging to a teachers' organization. Most of these studies have reached the conclusion that teachers' unions have had little success in raising salaries.[2]

In fact, a more appropriate conclusion which may be drawn from these studies is that within particular regions, districts that bargain do not pay much higher wages than districts that do not bargain. There is no effort within the context of these studies to determine to what extent the very existence of bargaining within a given region has raised teachers' salaries in all districts, bargaining and nonbargaining districts alike. That is, those districts that do not bargain may have actually raised wages of teachers in order to reduce the threat of having organized negotiations initiated in nonbargaining districts, or to remain competitive with districts that bargain in terms of their ability to recruit good quality teachers. What is required is a methodology which would allow the determination of not only the extent to which bargaining districts pay higher wages than nonbargaining districts, but also the extent to which nonbargaining districts raise their wages above competitive market levels to match the wages in bargaining districts. Indeed, it will be demonstrated below that the major impact of bargaining for teachers has been on a regional, rather than on a district by district, level, and, contrary to the results of previous studies, bargaining does appear to have

a substantial and significant effect on teachers' salaries.

Section I briefly outlines a model of resource allocation of the public school district. Teachers' negotiations are introduced into the model in Section II. The methodology for measuring the impact of bargaining is developed in Section III. Section IV presents the data and econometric problems involved in the empirical application of the model to samples of California public school districts. The empirical estimates of the impact of teachers' negotiations on resource allocation are presented and evaluated in Section V. Section VI consists of some concluding remarks.

I. A Model of Resource Allocation in Public School Districts

The focus of this analysis is the behavior of the individual public school district. There are primarily two basic decisions with which school decision-makers must concern themselves.[3] These decisions involve:

1. the allocation of educational resources among the various educational puts, and
2. the allocation of community resources between public education and all other goods and services,

Despite the fact that these two decisions occur simultaneously, each of the decisions will be considered separately within a two-stage process in order to identify the underlying structural relations which determine the allocation of resources within local school districts.

School district decision-makers are assumed to confront a set of structural supply equations for school inputs which specify the salaries of various categories of school personnel as functions of the endogenous quality characteristics (e.g., experience, educational preparation, and ability) and

working conditions (e.g., class sizes) and the exogenous characteristics of school districts which reflect the relative attractiveness of employment in those districts (e.g., district size, racial and ethnic composition of the students, and local labor market conditions). Given these salary equations, school officials allocate educational resources by maximizing the quality (as they perceive it) of educational services subject to a given arbitrarily selected level of the district's budget.[4] The solution to this optimization problem determines the optimal level of employment of school inputs denoted by the vector D* (e.g., teacher-pupil ratios--class size--and average teacher quality) as a function of those exogenous factors (denoted by the vector Z) that affect the relative prices of school inputs and the level of the district's budget (R). Formally, this demand equation may be specified as follows:

$$D^* = D(Z,R). \qquad (1)$$

Substituting the optimal levels of the endogenous variables as determined in equation (1) into the structural equations for the salaries of school personnel (denoted by the vector W) leads to an equation which determines the equilibrium levels of personnel salaries as functions of Z and R. One may write,

$$W^* = W(Z, R). \qquad (2)$$

For empirical purposes there are three categories of school personnel included in the vector W: teachers, instructional aides, and school administrators. For each of these three categories of school personnel, there are three elements in the vector Z: (1) the prevailing opportunity cost in the local labor market facing the respective category of school personnel (i.e., denoted WT, WI, and WA facing teachers, instructional aides, and school administrators respectively, and represented empirically by the average wages of registered

nurses, nurses aides, and public administrators--excluding school administrators) in the SMSA; (2) the racial and ethnic characteristics of pupils represented by the proportion of black pupils (SB) and the proportion of pupils with Spanish surnames (SM); and (3) district size (S = the number of pupils in the district). The opportunity costs are intended to reflect the relative attractiveness of becoming a teacher, instructional aide, or school administrator, while the racial and ethnic characteristics of pupils and district size are intended to represent the relative attractiveness of employment opportunities across individual school districts.[5]

Given the information contained in (1) along with the objective function which relates the (perceived) quality of educational services to the levels of the school inputs employed, school officials are able to trace out the relationship between the optimal levels of educational quality and the size of the educational budget (R), ceteris paribus.[6] The second stage of this decision process (i.e., the allocation of community resources) involves the maximization of a utility function, which describes the willingness of school district decision-makers to trade-off educational quality and tax burden per household, subject to the constraint that the total educational expenditures (R) be equal to the sum of local school property taxes and state and federal aid per pupil (R_g).[7] The solution to this problem determines the optimal total amount of resources per pupil devoted to educational services in the district as a function of those factors affecting the prices of school inputs (Z) (and, hence the price of educational quality) and a set of demographic and financial characteristics (denoted by the vector X) of the district which influence the decision to spend on education. Formally, this expenditure function may be written in the following form:

$$R^* = R\ (Z,\ X). \qquad (3)$$

With a few additional assumptions regarding the properties of the utility function of the district decision-makers, one can derive the following relationships: educational expenditures will increase in response to increased government aid ($\partial R/\partial R_g > 0$), but to some extent these funds will be used to reduce local property taxes ($\partial R/\partial R_g < 1$); the greater the relative number of children per family in the community, the greater would be the marginal tax burden per household to provide the given quantity of resources for education and, therefore, the lower will be the expenditure per pupil for education--on the other hand, the greater the number of families in the community who have school-age children, the greater will be the perceived willingness of the community to spend for education so that the net effect of the number of pupils per household (denoted S/N, N = the number of households) on educational expenditures is ambiguous; high income (denoted Y) districts will tend to devote relatively more resources per pupil to education ($\partial R/\partial Y > 0$); the greater the relative proportion of residential property denoted by V (and therefore, the greater the extent to which households--i.e., voters--as opposed to businesses--i.e., non-voters--must support educational services), the lower the expenditures on education ($\partial R/\partial V < 0$, referred to as the tax base composition effect). The effects of changes in the components of Z on R are ambiguous. However, one can state that if school spending increases (decreases) with those elements of Z which tend to raise input prices, then the demand for educational quality tends to be relatively inelastic (elastic).

II. Introduction of Teachers' Negotiations

Negotiation of Salaries. Teachers' negotiations are assumed to enter the model as a set of constraints on district decision-making. With regard to

salaries, it is argued that the teachers' union effectively negotiates a lower bound (denoted $\overline{W}$) on the parameters of district salary schedules for teachers. It is further assumed that the greater the relative bargaining power (denoted by a vector b) of the teachers' union, the greater the extent to which the constraints will exceed the optimal values of compensation (i.e., W^*). In addition, one generally observes that the salary schedules of other school personnel, including certain categories of school administrators, are explicitly or implicitly tied to the teachers' salary structure.[8] If this is the case, then successful negotiations for teachers may have the effect of placing implicit constraints on the entire salary structure of the school district. Formally, these constraints may be expressed in the following manner:

$$\overline{W}(b) \leq W(\cdot), \tag{4}$$

where $d\overline{W}/db > 0$.

The addition of the salary constraint (4) has the effect of bounding personnel salaries away from the desired optimum position (i.e., the maximum perceived quality for the given expenditure that would prevail in the absence of negotiations).[9] The higher the constraints are set, the further away from the optimum the district moves. Hence, the marginal perceived quality of each of the negotiated constraints is negative. If changes in perceived quality correspond to actual changes in quality (however defined), then successful negotiations will tend to reduce the quality of educational services.

The ultimate effect of changes in the bargaining power of teachers on the demand for any one of the inputs is indeterminate.[10] However, a priori reasoning is helpful in evaluating district responses. For example, if

teachers' organizations negotiate increases in compensation above the optimum level, school officials will be likely to raise hiring standards, since higher salaries will tend to attract higher quality teachers. Working against the ability of the district to adjust teachers quality, at least in the short run, will be the possible decline in the turnover rate among currently employed teachers in response to the higher salaries. The lower turnover rate combined with teacher tenure restrictions will reduce the margin of newly hired teachers through which the district can adjust teacher quality. District decision-makers may also view the higher salaries as a way to compensate teachers for poorer working conditions (e.g., increases in class sizes). However, the threat of a confrontation with the teachers' union over this issue of class size may well restrict the ability of the district to respond in this fashion. To the extent that school officials are unable, in the short run, to make these compensating adjustments in teacher quality and/or working conditions, teachers' salaries will be in excess of their optimal level.

The bargaining variables, b, formally enter the model at two levels: in the determination of (1) the input demand and personnel salaries, and (2) the demand for educational expenditure. Bargaining affects the relative prices of school inputs and, therefore, has a direct effect on the demand for these inputs. The formal representation of the input demand and salary equations, (3) and (4), differ only in the addition of the bargaining variables as shown below:

$$D^* = D(Z,R,b) \qquad (5)$$

$$W^* = W(Z,R,b) \quad . \qquad (6)$$

Along with these direct effects of bargaining on the allocation of

educational resources (i.e., $\partial D^*/\partial b$ and $\partial W^*/\partial b$), there are the effects of bargaining on the size of the total educational budget, R. Since bargaining has the effect of raising the relative price of educational services, it will certainly affect the decision to allocate community resources to education. The educational expenditure equation must also be rewritten as

$$R^* = (R, X, b) \qquad (7)$$

where the indirect effects of bargaining on the allocation of educational resources are defined by $\left[(\partial D^*/\partial R) \cdot (\partial R/\partial b)\right]$ and $\left[(\partial W^*/\partial R) \cdot (\partial R/\partial b)\right]$. A positive (negative) response of school expenditures to increases in teachers' bargaining power (and the accompanying increases in the salaries of a substantial proportion of school personnel) would suggest that the demand for educational quality is likely to be relatively inelastic (elastic).

Negotiation on Working Conditions. One need not look far into the literature regarding teachers' negotiations to find references to teacher concern over terms of employment and working conditions (e.g., class sizes). That is, teachers are also likely to attempt to impose constraints on such items as teacher-pupil ratios.[11]

The observed impact of bargaining on the equilibrium values of the decision variables would be the net effect of two opposing forces. On the one hand, an increase in bargaining power of the teachers would raise the constraints on compensation, thus increasing the salaries of school personnel and, for example, presumably reducing the demand for teachers (increasing class sizes). On the other hand, an increase in teachers' bargaining power may well exert a downward pressure on the acceptable limits on class size. This has the effect of increasing the demand for teachers (i.e., decreasing class size), working in the opposite direction as the price effect. Empirically, one observes only the net result of these two bargaining effects.

Alternatively, rather than simply impose constraints on district behavior, teachers' unions may, to some extent, become part of the decision-making process. To the extent that teachers perceive educational quality differently from school decision-makers and thus alter decision-maker perceptions of the educational process, resource allocation may differ between districts that do and do not bargain collectively with teachers. The simple interaction between teachers and school decision-makers which occurs through the formal bargaining process may raise issues regarding alternative methods of achieving improvements in educational quality that in the absence of bargaining might not have been raised. That is, if teachers perceive a relatively high marginal value of small classes on educational quality (whether due to their desire for improved working conditions or actual differences in perceptions of the educational process), then the presence of bargaining in a district may well have the effect of increasing the perceived marginal value of class size by district decision-makers and thereby, increase the demand for teachers.[12]

Based on the above analysis, bargaining may directly affect the "allocation of educational resources" in three ways: (1) through the imposition of the salary constraints, (2) through the imposition of constraints on working conditions, and (3) through effects on decision-maker perceptions of educational quality. With respect to the demand for teachers, (1) is likely to have a negative impact while (2) and (3) are likely to have positive effects. Empirically, if one observes that bargaining has a negative (positive) effect on the demand for teachers (class sizes), then it suggests that (1), reflecting district reactions to the effects of bargaining on compensation, dominates the combined effects of (2) and (3), and vice versa.

The Influence of Bargaining on Budget Decisions. Because of the increased benefits which accrue to teachers as a result of larger school budgets, it should be obvious that, where possible, teachers' unions will exert considerable effort in convincing the relevant decision-makers to increase school spending.[13] Such efforts to increase school budgets will operate through the union's attempt to influence the preferences of school decision-makers for educational quality. By using moral suasion and/or political pressure, teachers union will try to convince the school board and the community that an increase in educational quality (and, hence, educational expenditures) would be desirable. Furthermore, if greater preferences for educational quality are not forthcoming, teachers' unions may threaten to raise the psychic (if not monetary) costs to school decision-makers of acting in opposition to the interests or demands of the union. A final argument is to suggest that since improvements in educational quality necessarily involve greater spending and since school administrators are certainly aware of the fact that greater spending generally leads to increases (at least in the short run) in their own personal benefits (both monetary and nonmonetary), it is only natural to suggest that these administrators should have relatively strong preferences for improvements in the quality of educational services and, therefore, would support recommendations for budget increases. That is, administrative preferences for increased educational spending will tend to be rationalized by the rhetoric of improving, or at least resisting declines in, educational quality.

Formally, these effects of bargaining on the preferences of school decision-makers for educational quality suggest that the very existence of bargaining in a given district may lead to a higher relative value of educational quality at the margin and therefore to a positive influence on expenditures.

III. Measuring the Impact of Bargaining

As suggested at the outset of this paper, most of the previous empirical work on the impact of teachers' negotiations on salaries has revealed little significant difference attributed to bargaining. It is one of the main themes of this paper that these previous attempts to measure the impact of negotiations involve a basic misspecification of the model.

The standard approach for determining the impact of bargaining on teachers' salaries has been to include in a salary equation either a dichotomous dummy variable which indicates the existence of bargaining in a given district or a variable reflecting the fraction of teachers in the district belonging to the teachers' union.[14] The impact of bargaining measured in this fashion reflects the wage differential which exists between districts which bargain and districts which do not bargain. But this measure does not capture the total impact of bargaining.

Regional Effects of Bargaining. In fact, the very existence of bargaining in some districts may affect resource allocation in adjacent nonbargaining districts. In order to defer the advent of bargaining, school officials in nonbargaining districts may attempt to reduce the marginal benefits that teachers could achieve through the initiation of collective negotiations in the district by matching, at least to some degree, the salary increases and/or improvements in working conditions achieved in adjacent bargaining districts. By deferring the advent of bargaining in this manner, decision-makers in nonbargaining districts free themselves from the other costs and inflexibilities which are typically associated with collective negotiations. This response by nonbargaining districts is conventionally referred to as the threat effect.

There are two other factors which may increase incentives for nonbargaining

districts to match the higher salaries in bargaining districts. Relatively higher wages in bargaining districts may increase the difficulty which non-bargaining districts would have in recruiting a given quality of teachers' services. Furthermore, due to the tie between teachers' and administrators' salary schedules, higher teachers' salaries are very likely to be compatible with higher salaries for school administrators. This compatibility of benefits for teachers and administrators is likely to cause school district administrators to be vigorous proponents of higher salaries for teachers while using the "threat effect" argument or the district's ability to recruit good quality teachers as rationalizations for such action.

Going a step further with this argument, one might suggest that the extent of bargaining among districts in a given region may well affect the ability of teachers in the bargaining districts to gain benefits. As bargaining spreads throughout a region, the tactics of negotiation become more widely accepted, and cross-district support (e.g., sanctions placed on school districts by regional or state chapters of the teachers' union) among teachers' organizations becomes more common, the regional power of the teachers is bound to increase.[15] Moreover, each individual chapter of the teachers' union attempts to increase benefits to teachers by a little more than those achieved in neighboring districts--each successive teachers' union attempting to build on the gains achieved in adjacent districts. Such growth of regional power among teachers may lead to larger differentials between negotiated teachers' salaries and those that would have prevailed in the absence of bargaining in the region. Simultaneously, salaries in nonbargaining districts are likely to approach those paid in bargaining districts as the threat of organization spreads with the extent of bargaining in the region. Therefore, as the regional

strength of the teachers' union increases, teachers' salaries will tend to increase in both bargaining and nonbargaining districts.

The Methodology of Measurement. The observed salaries of school personnel employed in district i are written as follows:

$$W_i = W_i^{(c)} + B_1 f_i + B_2, \qquad (8)$$

where B_1 measures the salary differential between bargaining and nonbargaining districts (subsequently referred to as the district effects of bargaining); f_i is a dichotomous dummy variable which equals one if formal negotiations (i.e., negotiated agreements are reduced to writing) occurred in district i and zero otherwise; and B_2 measures the extent to which the salaries in nonbargaining districts exceed those that would have prevailed in the absence of bargaining in the region (subsequently referred to as the regional effects of bargaining). Based on the analysis above, one would expect the magnitude of this regional effect to be a positive function of the extent of bargaining in the region. Let u_i be the fraction of teachers in the region (where district i is located) covered by formal bargaining contracts, where $0 \leq u_i \leq 1$. For the purpose of the empirical analysis, a region is defined to be a county. Since the boundaries of a labor market do not necessarily correspond to those of a county, this definition of a region (i.e., local labor market) is obviously a first approximation.

The regional effects of bargaining may be written formally as

$$B_2 = B_2(u_i), \qquad (9)$$

where $B_2'(u_i) > 0$, and if $u_i = 0$, then the regional effects will disappear; i.e., $B_2(0) = 0$. For simplicity and because of the relatively small sample size, the function $B_2(u_i)$ is approximated by a linear function over the relevant values of u_i.[16]

Three possible cases emerge from this methodology. A district located in a region in which no bargaining occurs pays salaries at the competitive level; i.e., $W_i = W_i^{(c)}$ for $u_i = f_i = 0$. A nonbargaining district located in a region in which bargaining does occur will pay salaries equal to the competitive salaries plus the regional effect of bargaining; i.e., $W_i = W_i^{(c)} + B_2(u_i)$ for $0 < u_i \leq 1.0$ and $f_i = 0$. Finally, a bargaining district pays salaries which are equal to the sum of the competitive salaries, the regional effect and the district effect; i.e., $W_i = W_i^{(c)} + B_1 + B_2(u_i)$ for $0 < u_i \leq 1.0$ and $f_i = 1$.

The previous studies of teacher bargaining omit the regional effects and measure only the district effects, B_1. By this omission, these studies fail to determine the full impact of bargaining on teachers' salaries. Moreover, this omission of a variable from the regression equations leads to a bias in the measure of the district effects. If f_i and u_i are positively correlated, then estimates of B_1 derived from these studies are biased upward.[17] That is, these studies will tend to report a larger wage differential between bargaining and nonbargaining districts than actually exists, ceteris paribus. This issue will be discussed again in the empirical analysis.

IV. The Empirical Application of the Model

The Data. The empirical analysis will focus attention on a subset of the salary and demand equations for school inputs. The set of salary equations to be estimated includes the base salary (W_{0T}) and salary increments for additional experience ($\alpha_{TX}0$ and education (α_{TE}) paid to teachers, the salaries of elementary (W_{P_e}) and high school (W_{P_h}) principals, and the salaries of district

superintendents (W_S). The demand equation to be estimated is the demand for classroom teachers, i.e., the ratio of regular classroom teachers to pupils, $T = 1/C$, where C equals average class size. In conjunction with these salary and demand equations, a behavior equation for revenue per pupil (R) devoted to school expenditures will also be estimated.

The cross-section samples of individual school districts were selected for the empirical analysis: a sample of 39 elementary districts and a sample of 50 unified districts all located within the six largest SMSA's in California. The necessary data were gathered for the 1970-71 school year. The Appendix contains the descriptions, sources, mean values, and standard deviations of the variables.

Within the sample counties (i.e., those located within the six largest SMSA's), approximately sixty percent of the districts responded to the Winton Act Survey, from which the bargaining variables were constructed. The existence of the nonrespondent districts forces the omission of some of the observations in each of the samples, and to the extent that the missing observations are not randomly distributed, they are likely to introduce a systematic bias into the empirical results. Examination of these data, however, suggest that the omission of these nonrespondent districts does not present a significant problem of bias.[18]

Unfortunately, the fact that some districts did not respond to the Winton Act Survey also leads to a measurement of error in the variable u_i (the fraction of teachers in a region--county--covered by a bargaining agreement). Hence, the estimates of the regional effects of bargaining presented in the next section will exhibit a downward bias.

Since there are no easily accessible data on the ratio of real residential to total real assessed valuation of property, some proxy variables are substituted. Letting residential property value be a linear function of family income (Y) and the various environmental characteristics of the community assumed for this purpose to be captured by the racial and ethnic composition of the community (measured for empirical purposes by SB and SM), one may specify the following expression for the ratio of real residential to total real assessed value of property.

$$v = \gamma_0 \frac{1}{V} + \gamma_1 \frac{Y}{V} + \gamma_2 \frac{SB}{V} + \gamma_3 \frac{SM}{V}, \qquad (10)$$

where $Y_1 > 0$ and $Y_2, Y_3 < 0$. This equation may then be substituted for γ in equation (7) to become a determinant of school expenditures.

The Econometric Methodology

Because of the relatively small samples of school districts, it seemed appropriate in most instances to use linear approximations for the relationships between the dependent and independent variables specified in the behavioral equations. However, in some cases variables are entered into the model in a nonlinear form because it (1) improved the predictive power of the equations, (2) increased the precision of the estimates of the average elasticities of the dependent variables with respect to the particular independent variables, and/or (3) conformed to a priori expectations or theoretical restrictions regarding the nature of the relationship. Although the system of equations (7), (8), and (9) which define the model appears to be recursive in R, the budget is likely to be correlated with the disturbance terms in the salary and input demand equations since the equilibrium values of the personnel salaries and demands for school inputs are, in fact, determined simultaneously with the size of the district's budget.[19] In order to provide for consistent estimates of the parameters of the model, two-stage least

squares is used to estimate the salary and demand equations.[20] In the empirical application of the model, both ordinary least squares and two-stage least squares methods were used. Since the two estimation procedures yield substantially the same results (with 2SLS estimates exhibiting somewhat less precision--lower t-statistics--than the OLS estimates), the empirical analysis will focus attention on the 2SLS estimates.

One final issue which deserves mention involves the possible simultaneity which may exist between bargaining and teachers' benefits. For example, not only might teachers' salaries be a function of bargaining, but also the occurrence of bargaining might be a function of teachers' salaries.[21] This possibility of simultaneity between teachers' terms of employment and bargaining was subjected to empirical test and was rejected. Based on these results, simultaneity does not appear to be a problem and, hence, the bargaining variable f_i is assumed to be exogenous to the model.[22]

It should also be noted that while on a regional level there may well be a simultaneous relationship between teachers' salaries and the fraction of teachers covered by formal bargaining contracts (u), for any given district the extent of bargaining in a region is assumed to be exogenously determined.

V. Empirical Estimates of the Impact Teachers' Negotiations

Estimates of the salary, input demand, and educational expenditure equations for unified and elementary districts are presented in Tables 1a and 1b, respectively. These estimates are basically consistent with a priori

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Tables 1a & 1b about here.
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theoretical and intuitive expectations. This empirical analysis will focus on the coefficients of the bargaining variables.[23]

Recall that bargaining has both direct and indirect effects on the equilibrium salaries (W*) and input demand (D*). The direct effects reflect the changes in the optimal values of W and D in response to changes in the bargaining variables, holding the budget (R) of the district constant, i.e., $\partial W/\partial b$ and $\partial D/\partial b$, respectively. The indirect effects reflect the impact of changes in the bargaining variables on the district's budget which ultimately changes the optimal values of personnel salaries and input demand, i.e., $(\partial W/\partial R) \cdot (\partial R/\partial b)$ and $(\partial D/\partial R) \cdot (\partial R/\partial b)$, respectively. The total effect of bargaining is then defined as the sum of these direct and indirect effects. Because of the relatively small budget elasticities of both the salary and input demand equations, the indirect effects of bargaining generally contribute very little to the total effects of bargaining on either salaries of school personnel or the demand for school inputs.[24] In summarizing the empirical results, it is the total bargaining effects that are the focus of attention. Table 2 presents the impact of bargaining (in both percentage and absolute terms) calculated at the average value u_i for the sample dis-

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tricts (i.e., $\bar{u}$ equals .70 and .72 for the unified and elementary samples, respectively). In order to examine the potential impact of bargaining as negotiations spread across school districts in a given region, Table 3 presents estimates of the bargaining effects under the assumption that all

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teachers in a region are covered by bargaining contracts (i.e., $u_i = 1.00$). Since three of the counties included in the samples approach one hundred percent coverage, this extrapolation is not far outside the range of values

for which the regression estimates were obtained.[25]

Impact of Bargaining on Teachers' Salaries. In contrast to the results of most of the previous studies, the findings presented in Tables 1a and 1b indicate that collective bargaining has had a positive and statistically significant impact on teachers' salaries. On the average (see Table 2), teachers' salaries have increased by 5.7% and 12.2% in unified and elementary school districts, respectively. Of further interest and particular importance is the fact that these effects of bargaining are virtually entirely regional in nature. That is, bargaining has apparently resulted in negligible differences between bargaining and nonbargaining districts located within a given region (measured by the district effects of bargaing presented in columns 7 and 8 of Table 2) because the nonbargaining districts have matched almost fully the salary differentials that have been negotiated by teachers in bargaining districts. Hence, the regional effects of bargaining (presented in columns 3 and 4 of Table 2) are the strongest and best measure of the impact of negotiations on teachers' salaries.

For the purpose of comparison with previous studies, the base wage equations for teachers were also estimated using only the bargaining dummy variable (i.e., the district effect--f_i) to measure the impact of teachers' negotiations on salaries (i.e., the equations omit the regional effect, u_i). These estimates of the bargaining effects were statistically significant at the 90% level in the unified sample and statistically insignificant in the equations estimated for the elementary sample. The magnitudes of these estimated wage differentials between bargaining and nonbargaining districts are larger than those calculated from the regression estimates presented in Tables 1a & 1b which account for the regional effects of bargaining. It is

apparent from these results that omission of the regional effects imparts an upward bias to the estimated wage differential between bargaining and nonbargaining districts. This further suggests that the previous studies which omitted the regional effects perhaps were reporting larger wage differentials between bargaining and nonbargaining districts than actually exist.

The empirical results further indicate that the magnitude of the bargaining effects varies positively with the regional power of the teachers' unions. Regional power of the teachers is assumed to be measured by the fraction of teachers covered by bargaining contracts within a region (i.e., defined to be a county for empirical purposes). This suggests that the greater the fraction of teachers covered by bargaining contracts, the larger will be the gains from bargaining and the greater the tendency (e.g., due to threat effects) for nonbargaining districts in the same region to match the gains in bargaining districts. Based on the empirical estimates, with 100 percent of the teachers in a region covered by bargaining contracts (see Table 3), teachers' salary increases range from 7.5% for unified districts to 16.8% for elementary districts. Comparing these estimates with the estimates of the average salary differentials of 5.7% and 12.2% which are based on approximately 70 percent coverage of teachers by bargaining (i.e., the average level of coverage across the sample regions), one can get some indication of the possible consequences as bargaining becomes more prevalent within the various regions and perhaps across individual states. These estimates of around 8-17% (based on the assumption of 100% coverage) are comparable to other estimates of the effects of unions in the public sector reported by Ehrenberg (1973) and Ashenfelter (1971), and are also within the range of union relative wage effects estimated by Lewis (1963) for the private sector.

One phenomenon which has captured the attention of educators in recent years is the apparent surplus of teachers. It is interesting to note that the success of teachers' unions in pushing up salaries above the competitive level is consistent with the existence of a surplus of teachers. Of course, compounding this apparent excess supply of teachers is the decline in the rate of growth or the actual decrease of demand for teachers in some areas due to stabilizing or declining populations of school age children. It should be noted in passing that the surplus of teachers has perhaps strengthened teachers' preferences for unionization as a method of insulating themselves from the reductions in job security and declines in mobility of teachers that might otherwise characterize the free market.

Impact of Bargaining on Administrative Salaries. Because of the apparent relationships between the salary schedules of teachers and administrators, teachers' negotiations also appear to have positive (though statistically insignificant in the case of W_s and W_{p_n}, while significant for W_{p_e}) effects on the salaries of school administrators. On the average (see Table 2), the magnitudes of these effects range from 3.5 to 5.9 percent in unified districts and from 10.4 and 12.2 percent in elementary districts. Moreover, since teachers' salaries are positively related to the regional power of the teachers' unions, the same is true for administrative salaries. That is, the greater the regional power of teachers (and, presumably, the greater the salary increases for teachers due to bargaining), the greater will be the salary increases for administrators. Assuming 100 percent regional coverage for teachers, the estimated effects of bargaining on administrators' salaries range from 2.3 to 7.5 percent in unified districts and 14.0 to 14.6 percent in elementary districts.

In elementary school districts, there is a clear pattern of bargaining effects on administrative salaries which is similar to that found for teachers. There are fairly substantial regional effects (significant at the ninety-five percent level for elementary principals) and negligible district effects. Furthermore, in comparing the average effects of bargaining on teachers' and administrative salaries in elementary districts, one discovers that they are of the same order of magnitude. The strong regional effects in elementary districts suggest that administrators in nonbargaining districts do apparently, benefit from the decisions to match the increase in teachers' salaries which occur in bargaining districts. That is, this evidence is consistent with the hypothesis that school superintendents have strong incentives to provide local boards of education with some sort of rationale (whether it be in terms of threat effects or arguments regarding the district's ability to compete in the market for high quality teachers) which would support a policy in nonbargaining districts of matching the wage increases obtained by teachers in bargaining districts.

The empirical results for unified districts do not exhibit the same clear patterns as do the elementary district results. The regional effects of bargaining are negative for superintendents and positive for both high school and elementary school principals. The district effects are positive in each case and appear to be somewhat stronger. Because of this inconsistent pattern of bargaining effects on administrative salaries in unified districts, one might suspect that there is a confounding of the impact of the regional and district effects. Perhaps further research with larger samples of school districts will be necessary to yield more consistent results.

In general, the evidence of bargaining effects on the salaries of administrative personnel supports the view that administrators have something to gain from the successes of teachers' unions in negotiations. Higher salaries for teachers lead to higher salaries for administrators and, hence, suggest that there is a compatibility in the motivations of teachers and administrators. In both elementary and unified districts, the combined direct regional and district effects of bargaining on administrators' salaries are of the same order of magnitude as are the combined effects on average teachers' salaries in the respective type of district. Given the fact that high level administrators are often designated as bargaining agents for local school boards in negotiations with teachers and given their influence (through their control over the nature and interpretation of information) on board decisions, school district administrators are potentially in a position of advantage over the school board in recommending and rationalizing, for example, salary increases for teachers. A countervailing factor which affects administrative behavior involves the obligation of district administrators to take into account the willingness of the school board to impose the necessary increase in the tax burden on the local community. This willingness will largely depend upon the preferences of the local community and the ability of the superintendent to make a case for his recommendations. In this day of "taxpayer revolt," this may well be an important constraint on administrative behavior. Nevertheless, based on all of these considerations, one would suspect that the practice of designating the superintendent or any other high level district administrator to represent the school board in negotiations with teachers is not necessarily in the best interest of the local community. An alternative would be for the members of the board either to negotiate directly with teachers' representatives or designate a third party (e.g., out-

side experts in the field of labor relations) not involved in the normal operations of the school district to represent them in negotiations.

Impact of Bargaining on the Demand for Teachers. Although the estimated effects of bargaining on the demand for teachers are statistically insignificant, it is an interesting and worthwhile exercise to examine the magnitudes of these effects in view of the statistically significant effects of bargaining (and, in particular, the regional effects) on teachers' salaries.

In general, one would expect that if bargaining by teachers had the effect of increasing teachers' salaries, the demand for teachers (optimal class size) would decline (increase). Furthermore, given the relatively stronger regional (as opposed to district) effects of bargaining on teachers' salaries, one would predict that the regional effects on the demand for teachers would be relatively stronger. In fact, the empirical results are consistent with both of these statements. In particular, the direct regional effects are the strongest and most consistent since they all imply a reduction (increase) in the demand for teachers (class size). On the other hand, the differences in class sizes between bargaining and nonbargaining districts (i.e., the district effects) are relatively small.

Nevertheless, only the demand for high school teachers appears to be affected to any significant degree by bargaining. Reflecting predominantly the negative regional effects, the total impact of bargaining on the demand for high school teachers is, on the average (i.e., u = .70, Table 2) equal to -5.3%, which is equivalent to an increase of about 1 1/2 pupils per class. Assuming 100 per cent of the teachers in a region are unionized (u = 1.00, Table 3), bargaining reduces the demand for high school teachers by 8.0 per cent or increases class size by 2 1/4 pupils.

The total impact of bargaining on elementary class sizes is small in both unified and elementary districts. In fact, in elementary districts bargaining actually leads to a decline in class sizes (i.e., an increase in the demand for teachers) of about one pupil. Examining the components of this effect, one finds that the negative direct regional effects are offset somewhat by the positive indirect regional effects of increased school spending due to bargaining. Although statistically insignificant, the total district effects increase the demand for teachers (i.e., reduces class sizes). This reduction in elementary class size may reflect the influence of the teachers' union on the decision-making process of the school district. As discussed in Section II, the very existence of collective negotiations adds a dimension to the decision-making process which may exert an influence in perhaps either of two ways: (1) by raising the (psychic or monetary) costs of school decision-makers of acting against the best interests or demands of the teachers' union, and/or (2) by influencing decision-makers' perceptions of the educational process. In either case, given the long history of teachers' concern over class sizes, one would predict that this added dimension of the decision-making process would certainly have the effect of increasing the tendency for smaller classes. Of course, this effect runs counter to the decrease in the demand for teachers resulting from negotiated wage increases so that one observes only the net result of these two effects in the empirical estimates.

The apparent difference in the price-elasticities of demand for high school versus elementary school teachers might be attributed to a difference in the nature of the perceived educational technologies for the two levels of education. Specifically, variations in high school class sizes may not have as significant an impact on the perceived quality of educational services as would similar variation in elementary school class sizes.[26] Therefore, one would expect that a change in the price of teachers' services, for example,

would tend to elicit a relatively greater response in the demand for high school teachers than in the demand for elementary school teachers.

Note that the differences in the elasticities of the demand for elementary versus high school teachers may, to some extent, account for the relative differences between elementary and unified districts with respect to the success of teachers in negotiating increase in salaries. That is, the disemployment effects and, hence, the effects on class sizes (i.e., working conditions for teachers) are greater among high school teachers. These relatively greater disemployment effects reduce the advantage and, therefore, to some extent the relative power of the teachers' union to negotiate salary increases. High school teachers may be less vigorous than elementary school teachers in trying to negotiate wage increases, since it is the working conditions (class sizes) of the high school teachers that will be affected to the greatest extent. Therefore, the elementary teachers in unified districts apparently suffer compared to their fellow teachers employed in elementary districts simply because they bargain collectively along with high school teachers. Based on this evidence, one might predict that the impact of bargaining on teachers' salaries in high school districts would be smaller than those observed in elementary school districts, ceteris paribus.

Impact of Bargaining on School Spending. The empirical results indicate that bargaining does not have a statistically significant effect on educational spending. Nevertheless, it is worthwhile to examine the magnitudes of the estimated effects to determine whether or not they can be given a reasonable interpretation within the framework of the model. However, the reader is to be cautioned in placing too much reliability in the estimated effects of bargaining on spending in unified districts. A number of alternatives equations were run for educational expenditures, and examination of these results indicate a

considerable variation in the estimated coefficients of the bargaining variables (f_i, u_i) for the unified equations. In contrast, the estimated effects for elementary districts were reasonably stable under the alternative specifications of the expenditure equations. In fact, in two of the four alternative equations, the district effects of bargaining (i.e., the coefficients on f_i) were statistically significant at the 90 per cent level.

The regional effects of bargaining on school budgets appear to reflect response to changes in the marginal costs of educational services (i.e., the increases in the salaries of school personnel attributed to, for example, threat effects). In elementary districts, total educational expenditures (school budgets) increase, on the average ($u = .72$), by 5.3 per cent in response to a 7.9 per cent increase in costs of educational services due to increased costs of school personnel resulting from negotiated salary increases.[27] This result suggests that the demand for elementary educational services (perceived quality) by school decision-makers tends to be relatively inelastic. School budgets in unified districts decreased (although the estimates varied considerably, being positive in some cases, under alternative specifications of the budget equation) in response to the regional effects of bargaining on school costs.

In the districts which bargain with teachers, a somewhat different pattern of behavior is observed with respect to changes in school spending. The district effects of bargaining appear to have only negligible influence on the salaries of school personnel and, therefore, relatively imperceptible effects on the costs of educational services. Given these negligible differences in costs between bargaining and nonbargaining districts, one would expect virtually no difference in expenditures, ceteris paribus. Although the district

effects of bargaining are statistically insignificant, the pattern and magnitudes of the effects have some interesting implications. The district effects of bargaining lead to an increase in school expenditures of 4.8 and 6.4 per cent for unified and elementary districts, respectively. To the extent that one can rely upon these estimates of the responses of district decision-makers to the existence of bargaining in the district (and there appears to be some stability, and, in some cases, statistical significance, in these estimates for elementary districts), these estimates suggest that there is something more than just a response of the demand for educational quality to the changes in prices of educational inputs. These results are consistent with the hypothesis proposed in Section II that the very existence of bargaining in a district may well affect the preferences (or at least the environment within which those preferences are expressed) of decision-makers with regard to educational quality. That is, since teachers recognize that larger school budgets lead to greater benefits (e.g., higher salaries and smaller class sizes), the union representatives will attempt to exert every possible influence on the demand for educational quality and, hence, on school budget decisions. As suggested previously, this may be accomplished through some combination of moral suasion, political pressures and/or any other way of increasing the costs (both monetary and nonmonetary) of disagreement by the board with the teachers' union. Also consistent with the apparent excessive budget increase in bargaining relative to nonbargaining districts is the hypothesis that superintendents will tend to be strong proponents for greater school spending. Such support will generally manifest itself as strong recommendations for improvements in the quality of the district's educational programs. The notion is that the benefits derived by administrators (both

monetary and nonmonetary), as well as those for teachers, are positively related to the budget and the existence of bargaining can be used as a convenient facade for rationalizing the necessity of budget increases.

VI. Concluding Remarks

One of the major issues confronting educators today is that of the effectiveness of our educational institutions. Thus, the growth of unionization in public education and its implications for educational effectiveness are areas of major concern for educational policy. This study has provided at least some tentative evidence on the impact of bargaining on various aspects of resource allocation in public schools. The evidence suggests that bargaining has raised the salaries of school personnel (both teachers and administrators alike) on the order of 8 to 17 per cent, has had a relatively small impact on class sizes (the demand for teachers), and has tended to increase educational spending (which is consistent with a relatively inelastic demand for education).

Much work is yet to be done. The empirical analysis of demand has been limited to only one school input (the quantity of teachers) and has been carried out on a relatively small cross-section sample of school districts in one state (California). The analysis should be extended to include the quantities and qualities of school inputs and a larger sample of school districts both over time and with different states. A comparative analysis across states would be useful in determining the differences in the impact of bargaining resulting from differences in public sector labor legislation which exists across states. Moreover, the power of many state teachers' organizations has also been directed toward increasing state financial support of public education. These efforts take the form of political lobbying at the state legislatures and political support of the state legislators who favor increased educational

spending.[28] This current study has made no attempt to determine the effects of teachers' unions on state support for education and thereby may, in fact, have left unmeasured a significant aspect of the impact of teachers' unions.

It has been the desire and intent of this study to propose an analytical framework which could form a basis for extending the current research to answer some of the questions proposed above.

FOOTNOTES

[1] See [3], [8], [9], [11], [17], [21].

[2] The range of estimates of the impact of bargaining on teachers' salaries is from 0-4.9 per cent.

[3] School district decision-makers are generally members of the local board of education and the high level administrators (e.g., the superintendent) of the district. However, in some districts voter approval is required for certain types of decisions (e.g., overriding tax rate maximums set by the state). In these situations the members of the community must be regarded as part of the team of district decision-makers.

[4] Because of the difficulties associated with defining educational output and technology in any precise manner, all that is relevant in this formulation of decision-maker objectives is their perception of school quality.

[5] Since the convention is to assume that there are psychic disadvantages associated with attempting to educate students from an ethnic or racial minority (whether it be due to the difficulty of teaching relatively disadvantaged students or simply due to discrimination on the part of educators), one would predict a positive relation between the salaries of school personnel and the fraction of minority students in a district. Both Levin [15] and Toder [22] found positive relationships between the fraction of minority pupils and public school teachers' salaries. Toder also reports that none of the other socioeconomic indicators had a corresponding effect on teachers' salaries.

Relatively large districts may be regarded as less attractive places to work due to the impersonal relationships between administrators and teachers, the distance placed between the average staff member and the decision-making process, and the bureaucracy which appears to characterize larger school districts.

[6] This relationship between perceived quality and the exogenous variables and resources devoted to education is analogous to the indirect utility function of consumer demand theory. For a description of the derivation of this indirect function see [14].

[7] The equilibrium conditions require that the marginal rate of substitution of school quality for school tax burden be equal to the marginal cost of educational services. The relationships described below in the text and the assumptions necessary to derive them are discussed in considerable detail in the author's dissertation. Since these relationships are not the focus of this paper, their discussion is minimized.

[8]Salaries of most of the instructional staff, as well as administrators, are usually determined by adding some absolute increment to, or a multiple of, the corresponding point of education and experience on the salary schedule of teachers.

[9]The addition of a constraint to a maximization problem will cause the optimal value of the objective function to be less than or equal to its optimal value in the absence of the constraint. For a further discussion see Appendix A, pp. 261-266, in this author's Ph.D. dissertation [5].

[10]See Appendix A, Section A-1.4, of the author's dissertation [5].

[11]For California school districts during the sample year (1970-71), explicit constraints on such things as class size were not generally written into formal contracts. The primary reason for this appears to be that the accepted interpretation (at least up to 1970) of the Winton Act, California's School Employer-Employee Relations Act, as not including such items as class sizes or staff-pupil ratios under the rubric of negotiable "employment conditions."

[12]For simplicity, this argument ignores the underlying process by which the various perceptions of educational quality are consolidated into a single perceived quality function. While this is certainly a worthwhile topic for investigation, it is regarded as beyond the scope of this research.

[13]Larger budgets generally lead to smaller classes, more instructional supplied, and higher salaries for teachers. Increased school budgets will increase the demand for teachers' quality, which induces an increase in at least the base wage paid to teachers. Since this increase in the base wage shifts the entire teachers' salary schedule upward, teachers currently employed in the district will perhaps receive salaries which are "too high" in terms of the current average quality of their teaching services. Hence, these teachers benefit from larger budgets.

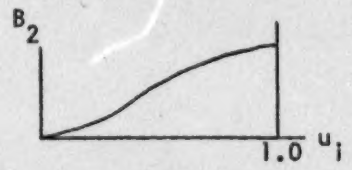
The notion that public sector unions will attempt to exert some influence on the budgets of the respective public agencies is not new to the literature. For example, see Wellington and Winter [23], pp. 17-21.

[14]This type of approach is used by all but one of the studies listed in footnote 1. Kasper [11] uses the individual state as the unit of observation rather than the individual school district as do the other studies of teachers' salaries.

[15]The California Teachers' Association has often placed sanctions on local school districts in response to what is viewed as a lack of reasonable cooperation between the teachers' organization and the local school board. These sanctions would involve such tactics as unfavorable publicity for the board of education, informational picket lines, and encouragement of new teachers not to apply for teaching positions in the district under sanction.

[16]One might have postulated a functional form such as the one illustrated in the figure (1) below:

Figure (1)



As bargaining is first introduced into a region, the magnitude of the regional effect increases at an increasing rate as threat effects and regional power of the teachers grow. As bargaining becomes pervasive within a region, the rate of increase in the regional effects begins to decline as threat effects become virtually complete and the marginal value of additional teacher power falls.

Such a functional form for $B_2(u_i)$ is not specified for the empirical analysis presented below. There are only ten counties included in the samples or unified and elementary school districts and, hence, only ten observations on the variable u_i. The inclusion of the necessary quadratic and cubic terms to describe the function in Figure (1) would have increased the likelihood of collinearity within the relatively small samples of districts used in the empirical analysis.

One could have alternatively specified equations (8) in log-linear form as is often done in studies of the impact of unions on wages. However, given the relatively small variations in the endogenous variables of the model (e.g., the wage and salary variables), the results for the linear and log-linear formulations are not likely to differ widely.

[17]See Johnston, pp. 168-169.

[18]This issue is discussed in some detail on pp. 173-75 and data is presented in Appendix E of the author's dissertation [5].

[19]The determination of the optimal level of educational expenditures depends upon the formulation of the indirect perceived quality function which in turn depends on the demand relationships for school inputs. Since these demand relations are stochastic, they must include disturbance terms. Therefore, school expenditure will be related to the disturbance terms of these demand equations.

[20]The budget equation (7) may be estimated by OLS since all of the independent variables are exogenous to district decision-making.

[21]See [18] and [19] for discussions of the possible relationship between unionization and employee compensation.

[22]The reader is referred to pp. 175-77 and Appendix F of the author's dissertation for a more complete analysis.

[23]Although the bargaining effects are statistically insignificant in some cases, the magnitudes of these effects are still of interest. Insignificance may simply reflect the relatively small size of the sample used for this empirical analysis.

[24]All elasticities presented are evaluated at the means of the dependent and independent variables. See the Appendix for the mean values of all of the variables used in this analysis.

[25]These three counties had coverage of 92.1 per cent, 92.5 per cent, and 96.0 per cent, respectively.

[26]The affective outcomes of the educational process such as pupils' attitudes, values, abilities to cooperate and work with others, and the development of other social and interpersonal skills are perhaps better accomplished in relatively smaller classes. Moreover, children at early stages of development are more likely to require the close personal attention of the teacher and may be relatively more responsive to changes in such attention than older children. Given the relatively greater importance which is likely to be attributed to these aspects of the educational environment within elementary school education, one would predict a differential impact of changes in class size on perceived educational quality between elementary and high school. There also may be less rigidity in the technology of secondary education with regard to the substitution of other inputs (e.g., capital inputs--computer assisted instruction, laboratory facilities in science and language--and/or teachers' aides) for teachers. In effect, the goals of high school education may not be threatened by larger numbers of pupils per teacher to the extent that the goals of elementary education are.

[27]The estimated increase in the costs of educational services are based on the regional effects of bargaining on teachers' and administrators' salaries combined with information of the average proportion of school budgets spent on teachers' and administrators' services. The regional effects of bargaining on elementary teachers' salaries were estimated to be about eleven per cent while the effects on administrators' salaries was about nine per cent. Teachers' services account for approximately sixty-three per cent of school budgets and administrative personnel account for approximately nine per cent of the budget, on the average.

Assuming 100 per cent coverage of teachers, the increase in educational costs are over twelve per cent for elementary districts while the corresponding effects of bargaining on school spending amounted to 7.4 per cent.

[28]In fact, the ABC--the Association for Better Citizenship--the political arm of the California Teachers' Association--has been one of the largest financial contributors to the campaigns of state legislators in recent elections.

APPENDIX

TABLE A

SYMBOLS, DEFINITIONS, DATA SOURCES, MEANS, AND STANDARD DEVIATIONS OF ALL THE VARIABLES[a]

Symbols (Definitions)		Data Source	Unified Districts		Elementary Districts	
			Mean	Standard Deviation	Mean	Standard Deviation
C_e	(av. elem. class size)	[C]	28.67	1.49	28.22	2.12
C_h	(av. high sch. class size)	[C]	28.08	2.30		
T_e	(elem. teacher-pupil ratio)	$1/C_e$	0.050	0.0019	0.0356	0.0029
T_h	(high sch. teacher-pupil ratio)	$1/C_h$	0.0359	0.0030		
W_{OT}	(base wage for teachers)	[H]	7,146	287.	7,027.	379.
α'_{TX}	(salary increment for additional years exper.)	[H]	402.	65.	377.	60.
α'_{TE}	(salary increment for additional units of educ.)	[H]	36.	7.	37.	6.
W_{P_e}	(av. elem. principal's salary)	[D]	18,119.	1,355.	17,701.	1,108.
W_{P_h}	(av. high sch. prin. salary)	[D]	20,982.	1,753.		
W_S	(salary of dist. supt.)	[E]	27,697.	3,973.	25,706.	3,002.
R	(educ. budget per pupil)	[A]	945.	218.	874.	152.
WT	(av. wage reg. nurses)	[K]	8,093.	225.	8,036.	314.4
WI	(av. wage nurses aides)	[K]	4,455.	306.	4,534.	359.
WA	(av. wage public mgrs. excluding sch. admin.)	[K]	12,306.	457.	12,511.	370.
S	(av. daily attendance)	[A]	12,935.	10,435.	6,921.	4,633.
SE	(prop. elem. pupils)	[A]	0.698	0.040		
SB	(prop. Black pupils)	[L]	0.030	0.056	0.011	.016
SH	(prop. Spanish pupils)	[L]	0.166	0.142	0.116	0.099
R_g	(state and fed. aid per pupil)	[A]	369.	97.	356.	101.
S/N	(pupils per household)[b]	[A],[J]	0.78	0.23	0.81	0.31
Y	(disposable income per household)[c]	[J]	7,777.	1,710.	9,469.	2,359.
V	(assessed prop. value per household)	[A]	8,963.	5,190.	10,594.	4,512.
f	(= 1, if formal bargaining = 0, otherwise)	[I]	0.78	0.42	0.67	0.48
n	(prop. teachers in country covered by barg.)	[H],[I]	0.70	0.27	0.72	0.22

[a] All of the monetary variables are deflated by regional price indices. The relative price levels for several large cities in the western United States are reported directly in source [H]. The price indices for the regions not specifically cited in [H] are extrapolated from information on population and region using a procedure described in M. J. Boskin, "The Economics of the Labor Supply," Memorandum No. 110, Research Center in Economic Growth, Stanford University, 1970.

[b] The variable S/N is constructed as the ratio of average daily attendance to the number of tax returns (N) filed by residents of the district where the number of tax returns serves as a proxy for the number of households.

[c] Disposable income per household is represented empirically by the difference between adjusted gross income and income tax per taxpayer in 1966 adjusted for the growth in disposable income between 1966 and 1970.

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TABLE 1a

EMPIRICAL ESTIMATES OF DEMAND, SALARY, AND EXPENDITURE EQUATIONS FOR UNIFIED SCHOOL DISTRICTS

Dep. Var. / Ind. Var.	T_e	T_h	W_{OT}	α_{IX}	α_{IE}	W_{P_e}	W_{P_h}	W_S [a]	E [b]
Const.	.072 (2.78)	0.16 (3.61)	-14905.4 (8.11)	704.67 (0.71)	-77.05 (0.60)	-44169.4 (-2.85)	-60366.3 (-2.90)	-57563.7 (-1.43)	1141.32 (0.59)
1/N	-7.96 (-4.31)	-6.40 (-2.05)	-608443. (-4.66)	-149089. (-2.11)	-596.55 (-0.065)	-2126940. (-1.93)	-1777010. (-1.21)	-6058670. (-2.22)	
WT	-.0000036 (-1.50)	-.000012 (-3.08)	1.92 (11.35)	-.036 (-0.40)	.012 (1.00)	5.02 (3.53)	8.26 (4.36)	8.19 (2.18)	0.16 (0.34)
WI	.0000051 (1.43)	.000022 (3.70)	-3.31 (-13.18)	0.10 (0.76)	-.018 (-1.01)	-8.16 (-3.85)	-9.88 (-3.50)	-10.03 (-1.91)	0.030 (0.11)
WA	-.0000022 (-1.14)	-.0000092 (-2.84)	1.65 (12.13)	-.023 (-0.31)	.0084 (0.89)	4.69 (4.10)	4.96 (3.24)	5.43 (2.00)	0.047 (0.32)
EB	.0048 (1.16)	.0062 (0.83)	172.38 (0.59)	67.27 (-0.42)	-6.80 (-0.33)	-1528.16 (-0.62)	448.56 (1.34)	6139.74 (0.44)	1533.32 (0.53)
EN	-.0035 (-1.97)	-.00019 (-.064)	-453.85 (-3.65)	61.70 (0.92)	1.24 (0.14)	-2673.29 (-2.55)	-4513.24 (-3.23)	-10284.7 (-3.32)	-730.35 (-2.30)
I/S	1.22 (0.58)	6.17 (1.72)	-758295. (-5.06)	-162475. (-2.00)	-17383.5 (-1.66)	-5064130. (-4.01)	-6243470. (-3.70)	-6521700. (-6.52)	162428. (0.61)
SE	.0083 (1.30)	.00031 (.029)	1927.00 (4.28)	22.15 (.091)	-11.82 (-0.38)	4392.34 (1.16)	-168.01 (-0.033)	8358.66 (0.88)	-2133.22 (-3.11)
$R_g(S/N)$									1.09 (2.32)
S/N									-673.14 (-2.60)
Y									0.0075 (0.29)
I/V									-1439810. (-0.87)
Y/V									-409.52 (-2.02)
SB/V									-5960580. (-0.35)
SN/V									5611630. (2.17)
f	-.00021 (-.35)	-.0000027 (.0028)	6.80 (0.16)	25.53 (1.14)	-2.68 (-0.93)	781.91 (2.24)	371.06 (0.80)	1430.08 (1.66)	45.07 (0.96)
u	-.00062 (-.45)	-.0031 (-1.30)	742.56 (7.51)	-58.88 (-1.10)	9.86 (1.43)	195.10 (0.23)	1141.98 (1.03)	-997.53 (-0.49)	-14.56 (-0.12)
R^2	.52	.46	0.90	.39	.13	.67	.64	.65	.69
F-statistic [c]	4.27***	3.33***	33.24***	2.52**	0.60	7.75***	7.07***	7.15***	4.51***
Joint F-test on bargaining variables (f, u)	0.26	0.97	32.65***	0.72	1.28	3.09*	1.28	1.62	0.41

[a] The salary equation for district superintendents was adjusted for the existence of heteroscedasticity by weighting the regression by $1/\sqrt{S}$.

[b] The expenditure equation was adjusted for the existence of heteroscedasticity by weighting the regression by $\sqrt{S}$.

[c] It is assumed that for unified districts the vector Z contains one additional element: the fraction of elementary school pupils (SE) in the district. This variable is simply intended to reflect the possible impact of the variation in the composition of pupils by level of instruction on the perceived educational technology.

[d] The statistical significance of the F-statistics are indicated as follows: *** = 99 per cent significance level; ** = 95 per cent significance level; and * = 90 per cent significance level.

TABLE 1b

EMPIRICAL ESTIMATES OF DEMAND, SALARY, AND EXPENDITURE EQUATIONS FOR ELEMENTARY SCHOOL DISTRICTS

Ind. Var. \ Dep. Var.	T_e	W_{OI}	α_{TX} [a]	α_{TE}	W_{P_e}	W_S [a]	R
Const.	0.14 (4.72)	-12838.3 (-3.44)	193.98 (0.24)	-173.17 (-1.72)	-32714.0 (-2.45)	-21867.0 (-0.74)	-1643.34 (-0.96)
1/R	-8.04 (-3.59)	-624309. (-2.25)	-69555.3 (-1.47)	8243.12 (-1.10)	-2817150. (-2.84)	-1671190. (-0.96)	
WI	-.0000048 (-1.33)	2.00 (4.48)	.076 (0.79)	.0058 (0.48)	6.33 (3.97)	1.93 (0.54)	0.21 (1.11)
WI	.000012 (2.73)	-3.08 (-5.47)	0.10 (0.87)	-.021 (-1.37)	-6.61 (-3.28)	-5.08 (-1.17)	-0.35 (-1.30)
WA	-.0000092 (-3.70)	1.42 (4.61)	-.068 (-1.04)	.020 (2.35)	2.54 (2.31)	4.43 (1.82)	0.18 (1.24)
SB	.064 (2.66)	-2201.32 (-0.74)	-20.86 (-.033)	-94.26 (-1.18)	-5952.51 (-0.56)	22875.9 (0.98)	-157.66 (-0.04)
SM	-.0050 (-1.27)	309.79 (0.64)	180.26 (1.75)	-14.94 (-1.14)	-1407.93 (-0.81)	1927.62 (0.51)	-135.98 (-0.22)
1/S	1.78 (0.73)	-381517. (-1.27)	-37748.9 (-0.79)	9682.32 (1.19)	-1492560. (-1.39)	-6513950. (-3.66)	293602. (2.46)
R_s(S/N)							0.84 (2.58)
S/N							-720.3 (-4.15)
Y							0.068 (2.55)
1/V							2454290. (1.14)
Y/V							-591.39 (-2.66)
SB/V							72775. (0.26)
SM/V							-423853. (0.09)
f	.00042 (0.57)	-46.58 (-0.50)	20.12 (1.06)	-3.08 (-1.24)	-103.07 (-0.31)	148.88 (0.21)	55.74 (1.41)
u	-.00041 (-0.20)	1167.57 (4.59)	31.96 (0.59)	9.16 (1.33)	2237.75 (2.46)	3167.37 (1.57)	63.99 (0.50)
R^2	.70	.74	.52	.29	.61	.63	.81
F-Statistic [b]	7.55***	9.19***	3.48***	1.32	5.07***	5.56***	6.85***
Joint F-test [b] on bargaining variables (f, u).	0.17	11.11***	0.53	1.24	3.16*	1.34	1.47

[a] These equations were adjusted for the existence of heteroscedasticity by weighting the regressions by $1/\sqrt{S}$.

[b] The statistical significance of the F statistics are indicated as follows: *** = 99 per cent significance level, ** = 95 per cent significance level.

TABLE 2

THE AVERAGE DIRECT, INDIRECT, AND TOTAL REGIONAL AND DISTRICT EFFECTS OF BARGAINING ON THE SALARIES OF SCHOOL PERSONNEL AND THE DEMAND FOR TEACHERS IN UNIFIED AND ELEMENTARY SCHOOL DISTRICTS[a]

Dependent Variable	Nonbargaining vs. Competitive Districts				Bargaining vs. Nonbargaining Districts				Bargaining vs. Competitive Districts	
	Regional Effects				District Effects				Total Effects	
	Direct Effects	Indirect Effects	Total Regional Effects		Direct Effects	Indirect Effects	Total Regional Effects		Total Regional and District Effects	
	($) (1)	($) (2)	(%) (1) + (2) = (3)	Absolute Effects (4)	(%) (5)	(%) (6)	(%) (5) + (6) = (7)	Absolute Effects (8)	(%) (3) + (7) = (9)	Absolute Effects (4) + (8) = (10) [b]
UNIFIED DIST.										
Salaries:										
W_{OT}	7.3	-0.1	7.2	$515	0.1	0.4	0.5	$36	7.7	$550
α_{TX}	-10.3	-0.4	-10.7	-43	6.4	1.9	8.3	33	-2.4	-10
α_{TE}	19.2	-0.0	19.2	6.56	-7.5	0.1	-7.4	-2.70	11.8	4.20
W_T [c]	4.5	-0.2	4.3	477	0.7	0.7	1.4	155	5.7	630
W_S	-2.5	-0.3	-2.8	-776	5.2	1.1	6.3	1,745	3.5	969
W_{P_a}	0.8	-0.1	0.7	127	4.3	0.6	4.9	888	4.2	761
W_{P_b}	3.8	-0.1	3.7	776	1.8	0.4	2.2	462	5.9	1,235
Demand:										
T_a	-1.2	-0.3	-1.5	+.43 p/c	-0.6	1.1	-0.5	+.14 p/c	-2.0	+.57 p/c
T_b	-6.0	-0.2	-6.2	+1.74 p/c	0.0	0.9	0.9	-.25 p/c	-5.3	+1.49 p/c
ELEM. DIST.										
Salaries										
W_{OT}	12.0	0.5	12.5	$378	-0.7	0.7	0.0	$00	12.5	$378
α_{TX}	6.1	0.1	6.2	23	5.3	1.1	6.4	24	12.6	48
α_{TE}	17.8	-1.4	16.4	6.07	-8.4	-1.6	-10.0	-3.70	6.4	2.37
W_T [c]	11.3	0.5	11.8	1,253	-0.2	0.6	0.4	42	12.2	1,296
W_S	8.9	0.4	9.3	2,391	0.6	0.5	1.1	283	10.4	2,673
W_{P_a}	9.1	1.0	10.1	1,788	-0.6	1.2	0.6	106	10.7	1,894
Demand:										
T_a	-0.8	1.4	0.6	-.17 p/c	1.2	1.7	2.9	-.82 p/c	3.5	-.99 p/c

p/c = pupils/class

[a] The figures reported in this table are calculated at mean values of the variables.

[b] The absolute effects in column (10) differ, in some cases, from the sum of columns (4) and (8) due to rounding.

[c] The impact of bargaining on average teachers' salaries (denoted W_T) is determined by the following formula:

$$\frac{\frac{\partial W_T}{\partial b}}{W_T} = \frac{\frac{\partial W_{OT}}{\partial b} + \sum_j \frac{\partial \alpha_{Tj}}{\partial b} \cdot \bar{q}_{Tj}}{\bar{W}_{OT} + \sum_j \bar{\alpha}_{Tj} \cdot \bar{q}_{Tj}}, \quad (j = X, E)$$

where $\bar{q}_{TX}$ and $\bar{q}_{TE}$ are the average levels of teacher experience and education, respectively, and $b = f$ for district effects and $b = u$ for regional effects. The bars over the variables indicate sample means. For unified districts, average teacher experience and education are weighted averages of these respective quality characteristics for elementary and high school teachers employed by unified districts.

TABLE 3

THE TOTAL REGIONAL AND DISTRICT EFFECTS OF BARGAINING ON THE SALARIES OF SCHOOL PERSONNEL AND THE DEMAND FOR TEACHERS IN UNIFIED AND ELEMENTARY SCHOOL DISTRICTS ASSUMING 100 OF THE TEACHERS IN THE LOCAL COUNTY ARE COVERED BY FORMAL BARGAINING AGREEMENTS[a]

Variable	Nonbarg. vs. Competitive Dist. Total Regional Effects (%) (1)	Nonbarg. vs. Competitive Dist. Total Regional Effects Absolute Effects (2)	Barg. vs. Nonbarg. Dist. Total District Effects (%) (3)	Barg. vs. Nonbarg. Dist. Total District Effects Absolute Effects (4)	Barg. vs. Competitive Dist. Total Regional and District Effects (%) (1) + (3) = (5)	Barg. vs. Competitive Dist. Total Regional and District Effects Absolute Effects (2) + (4) = (6)[b]
UNIFIED DISTRICTS						
Salaries:						
W_{OT}	10.3	$736	0.5	$36	10.8	$772
α_{TX}	-15.3	-61	8.3	33	-7.0	-28
α_{TE}	27.4	9.90	-7.4	2.70	20.0	7.20
W_T	6.1	681	1.4	155	7.5	829
W_S	-4.0	-1,109	6.3	1,745	2.3	637
W_{P_e}	1.0	181	4.9	888	5.9	1,069
W_{P_n}	5.3	1,109	2.2	462	7.5	1,574
Demand:						
T_e	-2.1	+.61 p/c	-0.5	+.14 p/c	-2.6	+.75 p/c
T_b	-8.9	+2.49 p/c	0.9	-.25 p/c	-8.0	+2.25 p/c
ELEMENTARY DISTRICTS						
Salaries						
W_{OT}	17.4	$1,219	-0.0	$0	17.4	$1,223
α_{TX}	8.6	32	6.4	24	15.0	57
α_{TE}	22.8	8.43	-10.0	-3.70	12.8	4.74
W_T	16.4	1,740	0.4	42	16.8	1,784
W_S	12.9	3,321	1.1	283	14.0	3,599
W_{P_e}	14.0	2,483	0.6	106	14.6	2,584
Input Demand						
T_e	0.8	-.24 p/c	2.9	-.82 p/c	3.7	-1.04 p/c

p/c = pupils/class

[a] $a_u = 1.00$

[b] The absolute effects in column (6) differ, in some cases, from the sum of columns (2) and (4) due to rounding.